

ART. XX.—*On Suggestions for the Formation of a Colonial Navy, and for securing Speedy and Certain Communication with Europe, and Defence of our Coasts in time of War.* By T. E. RAWLINSON, Esq., C.E.

[Read 21st November, 1862.]

1. The great desirability and need to Australia for increased facilities for mail communication with Europe, have long been felt and earnestly advocated in this colony, whilst our defenceless condition is notorious.

2. The object of this paper is to consider the subject in reference to the above-named points, and to suggest practicable means for affording relief, by giving the increased facilities required, and at the same time providing a self-contained system of protection and defence, which can be adopted wholly or in part, and at the same time be nearly if not entirely self-supporting. The few remarks which I venture to put forward on this subject, are the result of deep convictions, the gradual growth of years.

3. It is readily admitted that the present ocean postal service has been admirably carried out within the terms of the contract and the means of the Company, but the service is not the best that can be had either for frequency of delivery or speed; in addition to which, it may be discontinued at the will of a private company, without reference to the interests of the nation.

4. Whilst England remains at peace with the great maritime powers which are capable and enterprising enough, to fit out, or even to hire cruisers, for aggressive naval warfare, the whole of the evils consequent upon our present defective system and defenceless state are not felt; but such halcyon days may have an end, and the time may come when even the most peace-loving administration may find the empire under its care silently but inevitably drifting into war; and it is such a possible contingency we ought to contemplate when considering our future position and prospects. As the strength of a cable is determined by its weakest part, so the strength and security of a nation may be measured by its power not of aggression but of self-defence, and her weakness in this latter respect must be the measure of her strength.

5. In the question of mail communications and defence, Victoria is essentially imperfect and weak, and it becomes

imperative, if only as a matter of prudence, that we should look the whole of the facts full in the face, to see what means can be devised to meet the exigencies of the case. Victoria, by virtue of her position and trade, has by far the largest and the most vital interest of the whole of the Australian colonies in this matter; and this interest will be vastly increased by the spread of her railway communications into the interior; and it naturally follows that the larger her interests and the more important her wealth and trade in connection with England, the more desirable it will appear to an enemy in the event of war to strike the first blow at Melbourne, as a means not so much merely to ruin this country as a colony, as for the more important object of dealing an enemy a blow in a part where it will be the most keenly felt, with the least expenditure of power. In such position we stand at present, whilst our treasure ships alone, which are despatched from these shores, will form a large inducement to any belligerent to commission cruisers or privateers, although such power may be destitute of a port or of a single national ship.

6. The great distress caused in England by the stoppage of the cotton supplies will serve to some extent as an illustration of the wide-spread disasters caused by the interruption of only one branch of trade, (although such a possible contingency was foreseen for years), and her inability to ward off the blow was a consequence of her neglect to take timely measures in anticipation of such a possible misfortune. The calamity above alluded to, although serious to the British nation, never stopped her actual progress, but in our case the interruptions to our communications, the interception of our traders, or the bombardment of Melbourne, would, any, but especially the whole of them, be absolute ruin; comprehending as they do some of the greatest evils to which a young country can be subjected. It is only by timely provision against such possible contingencies that such evils can be averted. With war declared it will be too late.

7. There can be little doubt that, in the event of war, Great Britain will strain every nerve to make ample provision for the protection of her colonies and trade; and that, in making such provision, this country and the routes to and fro will command an important place. But it must not be forgotten that this colony is only one amongst many to be provided for, and that now, in the days of steam fleets, the Home Government will find it more necessary than ever to

employ by far the largest portion of her forces in guarding her own coasts and the avenues thereto, and, by the amount of tax thus levied upon her energies, have so much the less to employ on remote stations. But, even granting that Britain will maintain, as in days past, powerful fleets and cruisers in every sea, such will not and cannot be so ubiquitous as to prevent the most ruinous loss to these colonies from the operations of a few swift and moderately-armed steamships, under the control of an active experienced enemy. Such protection can only be afforded by a permanent, ever-available force in our own waters and under our own control, and by sufficient means for securing the transit of our mails and bullion across the ocean passage, without risk of interference from ordinary ships or from single cruisers. At present the means provided for the transit of mails and bullion offer every inducement for attack; but, by rendering the stoppage and attempted capture of such something more than dangerous—namely, madness—for ordinary ships to meddle with them, one very great source of temptation to an enemy and damage to ourselves would be removed, whilst for the ordinary merchandise the usual convoys would be available.

8. The discussions which have taken place of late years, both within and without the walls of the Imperial Parliament, all point to the strong growing feeling which exists in England, as to the necessity of the colonies generally, accepting the conditions of self-defence along with the grant of free institutions, yet at the same time freely admitting the responsibility of the Imperial power, for the proper distribution of her forces throughout the globe for the purposes of general protection. That such a course of policy is wise and just, few thinking men will deny, seeing that it is but an amplification of the national character and policy, which has taught the people to act for themselves, and fosters that self-reliance which has made the nation what she is.

9. To those who may object that my scheme is premature for so young a country, I reply that such objection is unfair; for if the country has not deemed itself too young for responsible government, she has no right to plead disinclination or inability for self-defence, or other of the responsibilities which responsible government entails. It is, I think, a tolerably well-known axiom that those who deserve freedom will defend it, and that those who possess freedom and are not willing

so to defend it justly deserve to lose it ; and lastly, those who are not willing to work and fight, to realise their own liberty, are not worthy defending or fighting for by others. That situate as this country is now, in reference to England, we have little more than a federal claim upon her for protection in the event of war, and hence the greater necessity for providing for ourselves by timely and efficient measures. A hostile squadron in Hobson's Bay would in a few hours levy a contribution, or do damage to the extent of double or quadruple the amount of the most ample means of defence in their first cost. Whilst on this part of the question, I may remark that, by a careful consideration of the subsequent statements and estimates, it will be seen that an efficient peace establishment can be maintained without actual war charges; and that in war it can be readily raised to the full strength, whilst the extra charges for men and material will be covered by the avoidance of the enormous war premiums which otherwise would be requisite to cover risks.

10. Having thus far endeavoured to show the reasons for entertaining the question of mail communication and defence, I will now summarise the existing means for such ends, and afterwards submit my proposed means for improving the same.

11. Firstly, our mail communication is monthly, and conducted by a private company under contract, and liable to be terminated at the interest or caprice of private persons, over whom the country has no control beyond the penalties, under a contract which may be forfeited, if more remunerative engagements are offered, or if they shall think the existing contract not sufficiently profitable. The system is monthly, and occupies upwards of fifty days in transit, whilst part of the route lies through what may be occupied at any time as an enemy's country.

12. Secondly, our defences consist of one steam sloop and shore batteries at the Port Phillip Heads and round Hobson's Bay.

13. Thirdly, the volunteer force on shore, consisting of rifle and artillery corps, with a naval brigade, and a small company of horse.

14. Some of the objections to the present system of mail communication have been already stated, but, in addition to such, there is a necessity for a more frequent and quick communication with Europe, together with a tolerable

degree of certainty in the delivery of the mails and bullion under the pressure and hazards of war.

15. The sloop of war *Victoria*, although admirable in her appointments, cannot be regarded as an addition to our effective means of defence in any other light than that of an armed tender, whilst the shore batteries, upon which such large sums of money have been expended, are even of less probable value. One of the most fatal objections to fixed batteries is their local and isolated character, whilst the difficulty of obtaining a sufficiency of trained men to work them, from amongst a small population like *Victoria*, is insuperable. This difficulty has been strongly pointed out by one of our Royal Engineer officers, in reference particularly to the defending of Port Phillip Heads. I would further remark, that a calculation based on obtaining small numbers of men with the requisite moral courage, and training to remain steady under fire in isolated batteries of one or two guns, such as those of Port Phillip, is expecting too much of human nature generally, seeing that such a trial ought only to be made, if made at all, with tried veterans, and men who have had a high degree of moral training, and even then only under very exceptional circumstances. But, apart from such considerations, I submit that the results of the last few years, in the Baltic and the Crimea, show the utter insufficiency of fixed forts against steam frigates capable of changing their place in an open roadstead, or even when running the gauntlet of a channel like the entrance to Port Phillip, supposing it to be necessary to run such passage in broad daylight, instead of under cover of the darkness of night. In reference to the mere construction of batteries, and mounting the same with artillery in this colony, it is simply a question of cost, which can be readily met; but, when erected, will they be worth the money they cost as a means of defence? and lastly, can a sufficiency of suitable, or indeed of any men, be found to work them? to both of which questions I must reply in the negative.

16. The colonial volunteer force is, no doubt, excellent in *morale* and general efficiency, although not numerous, and has been frequently complimented by the gallant officers who from time to time have inspected them; and, properly officered and led, the force would do good service as regards mere fighting.

17. Such being the state of our communications and of our

marine and land forces, I will now submit what I believe to be requisite for the wants of the country, and the means which I propose for effectively satisfying the same.

18. In the first place, it has long been a desideratum to increase the facilities of mail communication with Europe, which I purpose doing by establishing fortnightly ocean-borne mails, in lieu of the present system of monthly over-land mails, the time from port to port not to exceed forty-five days.

19. That the vessels employed should be built especially with a view to speed as well as strength, and armed for offensive and defensive purposes. That such a number should be kept afloat as to always insure having three or more of them in Hobson's Bay. That Melbourne should be made the terminus of the ocean line, and from thence the mails for the other colonies should be distributed by tenders of suitable size and power. That dockyards and arsenals should be formed at Melbourne, where every requisite for outfit and repair could be prepared and stored. That the men engaged in such dockyards and arsenals should be brigaded and sworn in, to serve whenever required for duty either afloat or on shore. That, in addition to the armed mail boats, at least one iron-cased floating battery should be stationed in Hobson's Bay, to take the lead and draw the fire in offensive and defensive operations against an invading force, and that a similar battery should be stationed off Queenscliff, for obstructing and defending the Heads entrance. That the steam ships and floating batteries should have a proper complement of trained men at a peace establishment, whilst the men engaged on shore duty, in the docks and arsenals, should be held available as a reserve, from which could be drafted the number required on any sudden emergency, to fill up the companies to the proper war complement, and that only such shore batteries should be retained, as could throw a concentrated cross fire on an enemy bringing up within shelling distance of Melbourne, the shipping in the Bay, or for the cover of the arsenals.

20. Such a concentration of service would bring the whole within such compass that a small community like Victoria would be able to deal with it, because, as I have before hinted, it is not to us so much a question of cost, as a question of men, in which we should have the greatest difficulty.

21. A service organised as above would possess a sufficient

fixity of interest to render it permanently available where most required, and yet having sufficient mobility to permit of its prompt removal for service to all points in Port Phillip, where its services might be needed, and even for service along the coast outside the Heads. The existing naval brigades are good samples of the kind of material such a service would foster around the port. The cost would be a minimum, because in time of peace the whole charge would be returned in reproductive works, if the system be adopted in its entirety.

22. The mail steamers must combine to some extent the conflicting duties of carriers and men of war, but this union, although usually opposed by naval officers, is one of the difficulties of the case which must be dealt with and overruled, if it cannot be rendered strictly compatible, because it is one essential condition of success, or rather hope for the establishment of such a force, that it shall, to a greater or lesser extent, be self-contained and self-supporting, and so be brought within range of our means. The objections held to the combining in one vessel the characteristics of a man-of-war and a merchant ship are, no doubt, very weighty, but in this case I cannot think them insuperable, because the merchandise and traffic conveyed by them would be quite exceptional in character and value to that of ordinary trade.

23. I estimate that, for the establishment and working of such a system, ten first-class ships and three tenders would be requisite, with one first-class depôt in Hobson's Bay, two second-class depôts, and three third-class depôts, at various termini and places on the line of route.

24. The first-class ships should be from 3,500 to 4,000 tons, and of not less than 800 horse-power nominal, coaling twice on the route, and making the passage, *viâ* the Cape of Good Hope, including stoppages, in forty-five days. The vessels should be of iron, and armed with one pivot gun forward, of the heaviest calibre to throw shot and shell, and two carriage guns aft, to be used as stern chasers, for the purpose of disabling a pursuing enemy. The especial duty of these ships would be to make their passage, and in doing so to avoid all fighting or other risk except in absolute self-defence. That only in port should the vessels be used for offensive purposes. The casing of such vessels ought not to exceed two inches in thickness, and that only in places where extra protection is necessary, as, for instance, around the hull above and below the water line, and around the

engines, boiler, and steering apparatus. A thickness of metal to protect against penetration by rifle bullets would be all that would be requisite generally for the upper works. Such vessels as the above described can be built to run from seventeen to eighteen knots and upwards per hour, and to carry such armaments as those proposed. When in port, extra protection can be given to the ships, in the prospect of actual engagement, as may be required, but for ocean service speed would be more essential than mere invulnerability. With a fleet of ten such ships there would always be three or more in harbour with their crews available for defensive purposes. Although such vessels would be of little avail against an iron clad, they would be most efficient against timber built ships.

25. The tenders, or second-class ships, should be of 600 tons, and not less than 150 horse-power, built and fitted similar to the first-class ships, but on a proportionate scale in all other respects. These ships would be available for distributing the mail service to the sister colonies, but their head quarters would be in Hobson's Bay, and when not on duty they would also form part of our marine for defensive purposes.

26. The first-class depôt should be established in Hobson's Bay, and consist of dockyards, slips, and arsenals, at which the fleet could be repaired or wholly refitted. Such a depôt would in itself have a most beneficial effect as a market for much of our produce, and in this respect reflect back upon the community, for whose protection it was created, a profitable result. The provisioning of the fleet alone would afford a considerable market for large quantities of our flour, beef, mutton, potatoes, and other esculents, together with fruits and wines, the produce of our orchards and vineyards.

27. For permanent defence in the Bay, two iron-clad floating batteries would be requisite, as before stated, with suitable steam power, to enable them to act as an advance to the other portions of the fleet. One of these batteries, if stationed off Queenscliff, would be available for obstructing the entrance, with greater effect than any fixed battery; because she could always keep within range by changing her place as the necessity for doing so should arise. With such defences, the occasion for shore batteries would be much diminished, although not wholly done away with.

28. In conducting such a service as the above, it is deemed not only necessary but politic that the ocean steamers should call at King George's Sound, and at the Cape of Good Hope,



for the purpose of coaling, and for the maintenance of communications direct, not only with India and China but with Africa, and also with a view to maintain in war time a duplicate communication with Europe, by having extra vessels running to Ceylon in connection with the Indian lines, but this does not form an integral part of the present scheme.

29. Of the subsidiary depôts, one of the second-class should be established at the Cape of Good Hope, and one at the port of destination in England, whilst of the third-class, one should be at Sydney, one at Hobarton, and one at King George's Sound.

30. The first-class depôt should contain every requisite for refit, coaling, provisioning, and supply of stores, arms, and ammunition complete. The second-class should contain every requisite for refitting and repair to the parts of the ships' engines and armaments most liable to derangement and wear, and for coaling and general stores; whilst the third-class depôts should be simply for coaling and ordinary stores.

31. At each depôt proper coal staithes and machinery should be erected, but more especially at King George's Sound and the Cape of Good Hope, of sufficient capacity to be able to deliver on board not less than sixty tons of coal per hour.

32. Annexed I give the cost of such a service as the one proposed, together with the annual charge and estimated revenue. It must not be forgotten, in considering the following estimates, that the expenditure is not necessarily an immediate one, but may be spread over a term of years, and the service extended as required. For instance, at first, a monthly mail could be placed, to run alternately with our present overland service, and this would afford satisfactory test of the soundness of the scheme, before proceeding further with the larger outlay for the whole, and with the expensive depôt at Hobson's Bay, and the colonial service. This would at once reduce the immediate outlay two-thirds. The cost of the iron-clads can be covered by at once stopping further outlay for the construction and armament of existing fortifications and experimental defences in the waters of Hobson's Bay.

33. Estimated cost of providing steam fleet, iron-cased floating batteries, and depôts suitable for establishing and maintaining a fortnightly mail service to Europe, *viâ* the

Cape of Good Hope, in forty-five days, and for defensive war :—

Ten first-class ships of 3,500 tons and 800 horse-power at £35 per ton ... ..	£1,225,000	0	0
Three second-class ships of 600 tons and 150 horse-power at £35 per ton ... ..	63,000	0	0
Armament for thirteen steam ships ... ..	30,000	0	0
One first-class dépôt ... ..	20,000	0	0
Two second-class dépôts ... ..	20,000	0	0
Three third-class dépôts ... ..	9,000	0	0
Two iron-cased floating batteries	200,000	0	0
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Total ... ..	£1,567,000	0	0
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34. Note.—The above does not include the ultimate extension of the first-class dépôt, as this would be the gradual growth of years. In this category is included about £600,000 of the above estimate (reducing the total to £967,000 expenditure) if the half of the scheme only be carried out as suggested in paragraph 32. The second-class ships also can be omitted, and the distribution of the mails, after their receipt in Melbourne, carried out by contract *pro tem*.

35. It must be further noted, that the estimate includes the full sum of £230,000 for warlike purposes, which is wholly unproductive in its character, although, in the estimates annexed, the interest and deterioration is included in the same table as the reproductive items.

36. The batteries would be constructed wholly of iron, to avoid the rapid decay and destruction contingent on those built in with solid masses of timber, injuriously cased but not hermetically sealed in iron. A navy, such as that now being constructed by Great Britain, will require to be replaced every nine or ten years, from the decay of the timber backing to the metal casing.

*Estimated Annual Expenditure and Revenue.*

Dr.	Expenditure.	£	s.	d.	Revenue.	£	s.	d.
10	first-class steam ships, as described, at £13,000 each	130,000	0	0	Amount of subsidy for monthly mail	...	134,000	0
3	second-class steam ships, as described, at £8,000 each	...	...	...	for extra mail	...	80,000	0
1	first-class depot	24,000	0	0	Voyage from England—			
2	second-class do.	17,000	0	0	40 first-class passengers, at £100	£4,000	0	0
3	third-class do.	10,000	0	0	do. at £50	4,800	0	0
2	iron-cased batteries	6,000	0	0	250 third-class do. at £20	7,000	0	0
		10,000	0	0	800 tons of freight, at £8	6,400	0	0
		£45,000	0	0	Voyage from Australia—			
		208,000	0	0	30 first-class passengers, at £100	3,000	0	0
		...	...	...	50 second-class do. at £50	3,000	0	0
		253,000	0	0	100 third-class do. at £20	2,000	0	0
		50,000	0	0	500 tons of freight, at £8	4,000	0	0
		150,000	0	0	80,000 ozs. of gold, at 6d.	2,000	0	0
		...	...	...	Total out and return voyage	£32,300	0	0
		313,400	0	0	24 double voyages, at £36,200	...	868,800	0
		£363,400	0	0				
		119,400	0	0	Total	...	£1,082,800	0
		£1,082,800	0	0	By surplus per annum	...	£119,400	0

NOTE.—No estimate is made of expenditure for ammunition, &c., the item being deemed irrelevant to the immediate question of a peace establishment.

No estimate has been taken of Government immigrants, nor has any consideration been exacted in return for more rapid delivery.

38. The preceding estimates of expenditure have been computed on a broad basis, so as to allow a large margin to cover unforeseen contingencies, and even to include some large items which for the present are not important or immediately urgent for the success of the scheme; whilst the revenue is estimated on a traffic which is much within the actual range of similar traffic, without making any allowance for the preference and increase of both, which is certain to accrue to speed and economy, combined with comfort. To commercial men, the certainty of a quick voyage at moderately reasonable rates, would induce much more frequent passages with a view of transacting business in person, instead of by letter, as at present.

39. The cost and charges are included for the second class ships, for distribution of the mails to the adjacent colonies, but no credit has been taken for any revenue from that source, although it is believed that it would cover the cost of the service.

40. It has been *an especial object* in the estimates, to *keep down* the *estimated* revenue from traffic to the *lowest point* necessary to cover the *largest charges*, in order to show that the scheme is within the compass of existing means, and that, whilst it shall be *self-contained*, it will be *self-supporting*.

41. The tonnage and power of the ships has been considered with care, having especial reference to the duties required, and the long sea-voyage. The tonnage of 3,500 tons is fixed, because beyond that size results are problematic, and the prospect of returns commensurate with cost of build and working more than doubtful, whilst vessels of less capacity are deficient in space, and wanting in mass to enable them to maintain a steady progress at a high rate of speed. The momentum being an important element in all moving bodies, it is especially requisite in steam ships, when it can be obtained without sacrifice of other advantages. Theoretically, this argument is equally good for a much larger ship still, within certain limits, but practically it is limited by the cost and ability to usefully employ the larger bulk, with a corresponding increase of freight and traffic. In the case of vessels built and fitted for speed, as in the present instance, freight will of necessity be limited in quantity, owing to the high rate, but passenger traffic need only be limited by available space and the numerical demands and inducements existing to travel to and fro between the two

countries. The maximum of 4,000 tons named in the body of this paper, would be better in the abstract than the size adopted in the estimate, but it is doubtful whether the large increase of cost, consequent upon such additional tonnage, would not raise the bulk sum largely without affording substantially a corresponding benefit.

42. The experience of the past few years has fully demonstrated the fact, that vessels of the class recommended can be built to steam at rates equal to the greatest named, and that the great ocean steam navigation companies have been gradually, but steadily, increasing the tonnage and power of their ships.

43. The *China*, one of the Cunard fleet, built a little time back, has a capacity of 2,750 tons, and engines of 560 horse-power, and on trial steamed against a strong *head wind* sixteen knots. Other vessels, under ordinary favourable circumstances, have run their eighteen, nineteen, and twenty knots. The above will serve to show that it is within the limits of what has been done, to estimate that the proposed line of ships can be built to run from seventeen to eighteen knots, and yet keep within the bounds of prudence, and that it is no rash assumption that such ships can and will make on an average from thirteen to fourteen knots throughout the voyage. It is estimated that vessels of such power and class would seldom, if ever, be in such gales as would prevent their running at half-speed, and their mass and build would neutralize dangers that would be fatal to smaller vessels under similar conditions.

44. It is now upwards of three months since this paper was first drafted and forwarded to Melbourne (4th July, 1862), but from some cause unknown to me, it has not reached the Society. Since that period Messrs. Burstall and Campbell's scheme, for 10,000 ton ships, has been laid before the public, and commented on through the public press, but although I have carefully consulted the reasons advanced in favour of the larger sized ships, and the large estimate for traffic, &c., &c., I have seen no reason for materially changing the views I had before expressed on the subject.

45. The amount of subsidy estimated will have to be chiefly borne by Victoria, seeing that she would be principally benefited by the realization of the scheme, although it is but reasonable to estimate a proportionate rate from each sister colony, to the extent in which she would participate in

the benefits of improved mail communication. But even if Victoria assumes the whole cost and the whole responsibility, it is an undertaking, like her railways, which will amply repay the country the outlay, in increasing security, and assured prosperity and peace at home.

Sale, 10th October, 1862.

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ART. XXI.—On Fossil Polyzoa. By HENRY WATTS, ESQ.,  
of Warrnambool.

[Read 29th June, 1863.]

Having for some years devoted a considerable portion of my leisure time to the study of the microscope and its attendant sciences, it is perhaps but a duty to place before you some account of my endeavours in forming a collection of plants and animals of microscopic growth. A catalogue of fresh-water Algæ and Desmidiaceæ was some time since laid before you, and, when leisure permits, one of Victorian Diatomaceæ will be compiled.

The portion of microscopic study to which I have lately devoted much time, has been the preparation of Polyzoa, collected in Lady Bay, between the mouths of the rivers Merri and Hopkins, over a distance of one and a-half miles, such locality having come under my particular attention as being nearest to the town of Warrnambool. I have, at the present time, over one hundred distinct species of Polyzoa, besides numerous specimens which, as it were, come between distinct species. Some thousands of specimens have passed through my hands, collected in all weathers, at all times, and various seasons, with, and on, Marine Algæ, shells, and pieces of stone, &c.; the most abundant source of supply is obtained from the large roots of kelp, cast ashore after storms, on fronds of *Peyssonnelia Australis* and shells of *Haliotis*.

Often have I gone down to the low-lying reefs on the west of the River Merri, and, watching for the retreating tide, suddenly made a dash after some weed, and as rapidly as possible returned for fear of some treacherous wave, hastily searched for these beautiful microcosms, placing them in bottles, and returned home to see them under the microscope. After a little while what a sight appears, all is life and activity, the protruding tentacles waving in all directions,